

AMENDMENTS TO THE CLAIMS

Please amend claims 1, 3-7 and 9-11.

Please add claims 12-16.

1. (currently amended) A method of manufacturing a semiconductor device, comprising the steps of:

(a) ~~providing a semiconductor substrate in which a floating gate electrode is formed;~~

(a) forming a tunnel oxide film on the semiconductor substrate;

(b) sequentially forming a first polysilicon film and a pad nitride film on the tunnel oxide film;

(c) etching the pad nitride film, the first polysilicon film, the tunnel oxide film and the semiconductor substrate with a patterning process to form a trench in the semiconductor substrate;

(d) depositing an oxide film on the entire structure including the trench and then planarizing the oxide film with the pad nitride film until the pad nitride film is exposed;

(e) removing the pad nitride film and then depositing a second polysilicon film on the entire structure;

(f) patterning the second polysilicon film to form the floating gate electrode;

(g) nitrifying the a top surface of the floating gate electrode;

(h) forming a dielectric film along the step of the results on the entire structure including the floating gate; and

(i) forming a material film for a control gate electrode on the dielectric film, wherein the step of nitrifying the tope of the floating gate electrode and the step of forming the dielectric film are implemented performed in-situ within the same chamber.

2. (original) The method as claimed in claim 1, wherein the dielectric film has an ONO structure on which a first oxide film, a nitride film and a second oxide film are sequentially stacked.

3. (currently amended) The method as claimed in claim 1, wherein the steps (b) and (e h) that are performed in-situ implemented within the same chamber and comprises the steps of:

(g)(1) introducing a N₂O gas flow of 100 ~ 10000 sccm at a temperature of 800 ~ 950°C to nitrify the top of the floating gate electrode;

(h)(1) introducing N₂O gas and DCS (SiH₂CL₂ SiH₂Cl₂) gas under at a pressure of 0.1 ~ 3torr and at a temperature of 790 ~ 830°C to form a first oxide film along the step on the entire structure;

(h)(2) introducing DCS gas and NH₃ gas under at a pressure of 0.1 ~ 3torr and at a temperature of 650 ~ 800°C to form a nitride film on the first oxide film; and

(h)(3) introducing N₂O gas and DCS(SiH₂CL₂ SiH₂Cl₂) gas under at a pressure of 0.1 ~ 3torr and at a temperature of 790 ~ 830°C to form a second oxide film on the nitride film.

4. (currently amended) The method as claimed in claim 2 3, wherein the a ratio of DCS (SiH₂CL₂ SiH₂Cl₂) gas and N₂O gas is in the range of 1:5 ~ 1:10.

5. (currently amended) The method as claimed in claim 1, wherein formation of the floating gate electrode is accomplished by the steps of:

~~sequentially forming a tunnel oxide film, a first polysilicon film and a pad nitride film on the semiconductor substrate;~~

~~etching a part of the pad nitride film, the first polysilicon film, the tunnel oxide film and the semiconductor substrate through a patterning process to form a trench within the semiconductor substrate;~~

~~depositing an oxide film on the entire structure including the trench and then making smooth the oxide film so that the pad nitride film is exposed;~~

~~etching the pad nitride film and then depositing a second polysilicon film on the entire structure; and~~

~~patterning the second polysilicon film to form the floating gate electrode~~

The method as claimed in claim 1, further comprising, between the steps (c)(a) and (d)(b), the step of implementing an annealing process using N₂ at a temperature of 900 ~ 910°C for 20 ~ 30 minutes.

6. (currently amended) The method as claimed in claim 1, further comprising, between the steps (e)(g) and (d)(h), ~~the a~~ step of implementing a steam anneal process of a wet oxidation mode at a temperature of 750 ~ 800°C so that the thickness of the dielectric film ~~becomes is in the range of~~ 150 ~ 300Å.

7. (currently amended) ~~A method of manufacturing a semiconductor device, comprising the steps of~~ The method as claimed in claim 1, wherein the steps (g) and (h) that are performed in-situ and within the same chamber and comprise:

(a)(g1) loading a semiconductor substrate in which a floating gate electrode is formed into a deposition chamber;

(b)(g2) changing the temperature within the deposition chamber to a first deposition temperature;

(c)(g3) nitrifying the top surface of the floating gate electrode at the first deposition temperature;

(d)(h1) changing the temperature within the deposition chamber to a second deposition temperature range;

(e)(h2) forming a dielectric film ~~along the step in on the entire structure at the~~ second deposition temperature range ~~to form a dielectric film; and~~

(f)(h3) unloading the semiconductor substrate from the deposition chamber.

8. (original) The method as claimed in claim 7, wherein the first deposition temperature is 800 ~ 950°C and the second deposition temperature range is 650 ~ 830°C

9. (currently amended) The method as claimed in claim 7, wherein the step (c)(g3) comprises introducing N₂O gas into the deposition chamber to nitrify the top surface of the floating gate electrode.

10. (currently amended) The method as claimed in claim 7, wherein the step (e)(h2) comprises the steps of:

introducing N₂O gas and DCS (SiH₂CL₂ SiH₂Cl₂) gas into the deposition chamber to form the a first oxide film;

introducing NH₃ gas and DCS (SiH₂CL₂ SiH₂Cl₂) gas into the deposition chamber to form the a nitride film on the first oxide film; and

introducing N₂O gas and DCS (SiH₂CL₂ SiH₂Cl₂) gas into the deposition chamber to form the a second oxide film on the nitride film.

11. (currently amended) The method as claimed in claim 10, wherein the ratio of DCS (SiH₂CL₂ SiH₂Cl₂) gas and N₂O gas is in the range of 1:5.about.1:10.

12. (new) A method of manufacturing a semiconductor device, comprising the steps of:

(a) forming a tunnel oxide film on the semiconductor substrate;

(b) implementing an annealing process so that a defect density at an interface between the tunnel oxide film and the semiconductor device is minimized;

(c) forming a floating gate electrode on the tunnel oxide film;

(d) nitrifying a top surface of the floating gate electrode;

(e) forming a dielectric film on the entire structure including the floating gate electrode; and

(f) forming a material film for a control gate electrode on the dielectric film,

wherein the nitrifying of the top surface of the floating gate electrode and the forming of the dielectric film are performed in-situ and within the same chamber.

13. (new) The method as claimed in claim 12, wherein the annealing process is perfomed in a N₂ atmosphere at a temperature of 900 ~ 910°C for 20 ~ 30 minutes.

14. (new) The method as claimed in claim 12, wherein the dielectric film has an ONO structure on which a first oxide film, a nitride film and a second oxide film are sequentially stacked.

15. (new) The method as claimed in claim 12, wherein the steps (d) and (e) that are performed in-situ within the same chamber and comprises:

introducing a N₂O gas flow of 100 ~ 10000 sccm at a temperature of 800 ~ 950°C to nitrify the top of the floating gate electrode;

introducing N₂O gas and DCS (SiH₂Cl₂) gas at a pressure of 0.1 ~ 3torr and at a temperature of 790 ~ 830°C to form a first oxide film on the entire structure including the floating gate;

introducing DCS gas and NH₃ gas at a pressure of 0.1 ~ 3torr and at a temperature of 650 ~ 800°C to form a nitride film on the first oxide film; and

introducing N₂O gas and DCS (SiH₂Cl₂) gas at a pressure of 0.1 ~ 3torr and at a temperature of 790 ~ 830°C to form a second oxide film on the nitride film.

16. (new) The method as claimed in claim 15, wherein the ratio of DCS (SiH₂Cl₂) gas and N₂O gas is in the range of 1:5 ~ 1:10.